

## Gastric Perforation Following Endoscopic Intra-gastric Balloon Insertion; Case Report and Literature Review

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**Keywords:** Intra-gastric balloon, life threatening complications, gastric perforation.

**Abstract:** Endoscopic Intra-gastric balloon placement is a well-known minimally invasive procedure used for the treatment of obesity. Recently, this procedure became very popular as a substitute for bariatric surgery. Although it is known as a safe procedure, life threatening complications, such as gastrointestinal hemorrhage, obstruction or perforation may occur. Herein, we describe a case of a young healthy patient, who presented with diffuse peritonitis due to acute gastric perforation 5 weeks after intra-gastric balloon administration. Upon entering the abdomen with diagnostic laparoscopy, a 4 mm perforation on the anterior wall of the stomach was detected. Following deflation of the balloon, intra-operative upper endoscopic removal of the balloon was attempted and failed. Gastrotomy and laparoscopic removal of the balloon along with closure of the gastrotomy by stapler line was done.

**Introduction:** Obesity, which is defined as a body mass index (BMI) of 30 or more, is a well-known health problem with a worldwide increasing incidence, mainly in the western countries (1). It is usually associated with multiple comorbidities, such as hypertension, diabetes mellitus type 2, coronary heart disease and stroke, it is also associated with increased risk for developing numerous types of tumors (2). To confront this epidemic disease, several treatment options offering various degrees of efficiency are available (3). These include life-style changes, pharmacological therapy and bariatric surgeries; Lifestyle changes, including behavioral diet modifications and regular physical activity, barely result in satisfactory weight loss (4). Pharmacological therapy also has limited weight loss effect.

Upon comparing the aforementioned therapeutic options, studies show that bariatric surgery is the most effective in long term weight loss sustaining and resolution of comorbidities (5,6). Although efficient in achieving weight loss, bariatric operations are invasive, highly expensive and restricted only for patients with morbid obesity (BMI $\geq$ 40) or type two obesity (BMI  $\geq$  35) with an associated comorbid disease (7,8). Intra-gastric balloon insertion, used for the first time in 1985, is a minimally invasive endoscopic procedure used for patients who do not qualify for bariatric operations, who attempted and failed at achieving weight loss with behavioral changes and medical therapy. Over the last 3 decades, several types of balloons were produced, with variable safety and weight loss achievement.

Although this procedure is regarded as a safe, with low complications rate, life-threatening complications, such as gastrointestinal bleeding, obstruction or perforation may develop. Herein, we describe a case of patient who presented with acute gastric perforation and diffuse peritonitis, several weeks following the administration of intra-gastric balloon.

**Case report:** A 32 years old healthy female patient, with a BMI of 29, presented to our Emergency Department complaining of severe upper abdominal pain. The pain lasted for several hours, started abruptly, and was described as sharp, diffuse, and with no radiation. She also suffered from nausea, recurrent vomiting, reduced appetite and fever. 5 weeks prior to her admission, she underwent intra-gastric balloon insertion. The procedure was uneventful, with no upper gastrointestinal pathology mentioned in the procedure report.

On physical examination upon her admission, the patient's vital signs were within normal limits, except for tachycardia of 110 b/min. An abdominal examination revealed diffuse tenderness with guarding. No abdominal mass was palpated. Digital rectal examination was normal. Complete blood count showed normal white blood cells of 8000, with a bandemia of 10%. Liver and kidney function tests were within normal limits. An upright abdominal and chest X-ray were normal. A Computed Tomography (CT) scan revealed free intra-abdominal air and fluid with intra-gastric balloon filled with liquid (figure 1). The patient was admitted with a diagnosis of hollow viscus perforation.

Due to these findings, the patient underwent an exploratory laparoscopy, during which a free purulent fluid was found in the abdominal and pelvic cavity, a perforation of 4 mm on the anterior wall of the stomach (figure 2) covered with fibrin was located, through which an inflated balloon can be detected. Peritoneal lavage along with deflation of the balloon by laparoscopic needle through the gastric hole, with primary repair with vicryl 3/0 sutures and omentoplasty was done. An intra-operative upper endoscopic removal of the balloon was attempted and failed (figure 3), and a decubitus ulcer on the internal mucosal part of the perforation site was detected. A 5 cm gastrotomy with laparoscopic removal of the balloon was performed. Closure of the gastrotomy was completed with wedge resection of the stomach including the ulcer site using a linear stapler. Her postoperative course was uneventful, and the patient was discharged home on post-operative day 6. Histopathological report revealed gastric ulcer with acute inflammation and transmural ischemia.

**Discussion:** As mentioned above, despite the escalating prevalence of obesity and its comorbidities worldwide, the availability of safe and effective weight loss therapies is limited. It has been already proven that bariatric surgeries are efficient treatment means. Nevertheless, these surgeries are restricted to a limited group of patients, due to their invasiveness and potential ensuing complications (9). Endoscopic Intra-gastric balloon placement is an emerging alternative utilizing minimally invasive means used for patients who do not meet the criteria for bariatric surgeries. In addition, endoscopic intra-gastric balloon insertion may occasionally be applied as a bridging temporary intervention that precedes bariatric surgery in severely obese patients (BMI  $\geq$  50), since said patients generally exhibit high pre-operative, anesthetic and technical risk for operations (10).

The intra-gastric balloon therapy is regarded as a restrictive procedure for weight loss, lacking a malabsorptive mechanism; a saline-filled balloon is inserted endoscopically into the stomach to promote a satiety feeling. A volume of 400 mL or greater can induce satiety (11). In addition, delaying gastric emptying may also add to weight loss and could be regarded as an additional mechanism. Several types of Intra-gastric balloons exist nowadays, with variabilities in materials (e.g; Silicone, polyurethane), volume (e.g; 250 ml, 450 ml, 550 ml etc.), adjustability and duration of therapy. The variety of options in these parameters are dependent on the balloon's brand.

The efficacy of intra-gastric balloon in promoting weight loss has been controversially denoted in several trials (12).

Contraindications for this procedure could be classified into absolute contraindications, which include previous stomach surgery, severe liver disease and pregnancy, and relative contraindications, such as large hiatal hernia, inflammatory bowel disease and chronic non-steroidal

anti-inflammatory (NSAID's) drug use (13).

Despite previously mentioned contraindications, most patients present satisfactory tolerance to endoscopic intragastric balloons. However, multiple post insertion complications were reported, with a wide variety ranging from mild complications to severe and potentially life-threatening ones. Mild complications are usually gastrointestinal symptoms that are directly associated to the gastric accommodation to the balloon, and may include mainly abdominal discomfort or pain, nausea and vomiting. Burping, dyspepsia and acid reflux have also been reported (14).

Typically, these complications are self-limiting, and relieved after a short period following the balloon insertion. Although uncommon, early balloon removal may be necessary if symptoms persist particularly in case of therapeutic proton pump inhibitor prescription failure (13).

Severe complications, such as obstruction, balloon dislocation, upper gastrointestinal bleeding, and perforation of either esophagus or stomach, although rare, may occur following intragastric balloon insertion. Incident rates vary between different sources in the literature. Our knowledge regarding the incidence of such complications is mainly based on individual cases, published as case reports by the treating surgeons or retrospective clinical studies by endoscopists (15). The alleged largest meta-analysis, which included 12 studies with 3429 patients (that collected data on complications following balloon insertion) presents an obstruction and gastric perforation incidence rates of 0.8% and 0.1% respectively. Mortality related to balloon in the aforementioned study was also very low at 0.1% (16).

The mechanism of perforation is not fully understood. Although balloons are not impinged into the gastric wall and are designed to be mobile inside the gastric compartments, it is not implausible that the balloon may exert direct pressure on the gastric wall after its insertion, thus promoting eventual perforation potentially due to decubitus ulcer. As a consequence, compliance to proton pump inhibitor medications may be crucial in preventing such eventual adverse outcome (17). From this rational, stems the recommendation of balloon removal after 6 months of insertion.

Timing of perforation as a complication following endoscopic intragastric balloon insertion ranges between insertion day up to 22 months following the procedure (15,17). Most commonly, perforation occurs within six months following insertion, suggesting that the procedure itself of either inserting intragastric balloon or the removal of it, is not inevitably in correlation with higher odds of perforation.

An intact gastric wall is initially considered a crucial prerequisite for such procedure, since coexisting risk factors may induce tissue ischemia and perforation cascade (13).

Reviewing the current English literature reveals only 22 cases of gastric perforation following intragastric balloon insertion (15), 2 of those cases ended in the patients' death. 17 out of the 22 cases were treated surgically, 3 conservatively and in 2 cases, treatment method was not reported.

Perforation of the esophagus may develop as a complication following intragastric balloon treatment of obesity. It is fortunately far less common than gastric perforation (2 reported cases), and was mainly attributed to inexperienced medical personnel.

Bowel obstruction as a complication was attributed either to intragastric balloon deflation, migration of the balloon or the patients' negligence of the need of balloon removal as recommended (15).

**Conclusion:** Endoscopic intragastric balloon insertion used for the

treatment of obesity seems to remain a relatively safe and non-invasive procedure with satisfactory weight management results. Although uncommon, serious and life-threatening adverse complications, such as gastric perforation, may occur. These complications could constitute a diagnostic challenge since patients could present with non-specific symptoms. Gastric perforation, a potentially fatal complication, should be immediately ruled out in patients that have undergone intragastric balloon insertion complaining of severe abdominal pain.

**Figures:**



Figure 1: Coronal CT scan showing free intraabdominal air and intragastric balloon.



Figure 2: On diagnostic laparoscopy, a 4 mm perforation on the anterior gastric wall was detected with fibrin surrounding it, through which an inflated gastric balloon is shown.



Figure 3: Intra-operative upper endoscopy revealing the deflated gastric balloon. Removal by endoscopic measures failed.

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